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First Record of *Croce filipennis* Westwood, 1841 (Neuroptera: Nemopteridae) from Kerala

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Abstract

The family Nemopteridae with the species *Croce filipennis* Westwood is recorded for the first time from Kerala. Description of the species with the images and the distribution in India is mapped.

Keywords: *Croce*, Nemopteridae, Kerala

Introduction

Neuroptera is one of the major group of holometabolous insects, which includes various structurally and biologically heterogeneous members. They feed on soft-bodied insects, including agricultural pests in their larval and adult stages, thus offer their use in biological control measures. There are 5,813 species of Neuroptera recorded worldwide among which 312 species belonging to 112 genera and 12 families are known from India which forms about 5% of the world occurrence (Oswald & Machado, 2018; Chandra & Sharma, 2009).

Nemopteridae is a bewitching family of Neuroptera which comprises two extant subfamilies, Crocinae (thread-wings) and Nemopterinae (spoon and ribbon-wings). The family is distinguished by their elongated ribbon or thread-like hindwings and specialised mouthparts with a long rostrum for pollen and nectar collection (Tjeder, 1967; Picker, 1987; Mansell, 1996). There are 146 species under 36 genera of Nemopteridae reported worldwide, which includes 48 species of Crocinae and 98 species of Nemopterinae (Oswald & Machado, 2018). In India, only four species belonging to three genera of Nemopteridae are reported (Oswald, 2020). Even though adult Nemopterids are obligate nectar and pollen feeders with specially adapted elongate mouthparts, the larvae of Nemopteridae are specialised predators, with elongated mandibles and maxillary laciniae adapted for piercing and ingesting the internal tissues of small arthropods (Popov, 1963, 1973).

The subfamily Crocinae is marked by its thread-like hindwings that function as tactile sensors and mate recognition systems (Mansell, 1996; Monserrat, 1996). The larvae of Crocinae have specialised habitat preferences including small caves, under-rock overhangs or hollow tree trunks, while the adults are mainly nocturnal and crepuscular (Sole *et al*., 2013). *Croce* McLachlan, 1885 come under this subfamily with *Croce filipennis* Westwood, 1841 as the only species reported from India.

According to the literature, this species is not reported from any other country. This graceful insect flies with a weak peculiar up and down motion with the long hindwings streaming in the air. The larvae are found among the dust and refuse on floors, feeding on small insects like psocids. The life history is completed in a year (Imms, 1911). Incidentally, scanning of the literature revealed the absence of Nemopteridae from Kerala. Thus, this report of *Croce filipennis* forms the first record of Nemopteridae in the state.

Material and Methods

Insects were collected using sweep-net and light trap. The collected specimens were killed by using a killing jar with 2 to 3 drops of Ethyl acetate. Later, specimens were dried, card mounted and held on entomological pins with proper labelling. The specimens were examined under Leica M205 Stereomicroscope. The terminology of wing venation and identification followed Navás (1910) and Tjeder (1967). Measurements were taken in millimetres.

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The digital imaging of specimens were carried out with Canon 7D Mark II digital camera with 100mm F/2.8L macro lens and Leica M205 Stereomicroscope. The distribution map of the species in India was plotted using SimpleMappr software. Specimens were deposited in the insect collections of Shadpada Entomology Research Lab (SERL), Kerala, India.

Results

Taxonomic Account

Genus *Croce* McLachlan, 1885

1885. *Croce* MacLachlan, *Proc. ent. Soc. Lond*., p. 378.

Croce can be easily distinguished by its transparent forewing with a well-marked pterostigma; external margin of forewing usually concave while the posterior part is convex and the hindwing is at least double than forewing in length with a little visible veins.

Croce filipennis Westwood, 1841

1841. *Nematoptera filipennis* Westwood, *Proc. Zool. Soc. Lond*., p. 13.

1921. *Croce filipennis* Dover, *Rec. Indian Mus*., **22**: 298.

Species is characterised by short clubbed antennae thicker towards end. Forewing narrow at base and broader in middle. Costal area of forewing with 15 veins before pterostigma. Pterostigma black, elongated filling 5 rows of cells (Figure C). Thread-like hindwing three to four times longer than body.

Description: *Colour and Measurements*: Female: Blackish-grey (Figure A). Body (Length: Width) = (7.3: 1.4), Forewing (Length: Width) = (10.2: 2.5), Hindwing (Length: Width) = (26.8: 0.5).

Head: Light-yellow in colour with a brown spot on vertex; eyes rounded and very prominent. Short clubbed antennae, noticeably thicker towards apex. Mouth parts modified with a prominent rostrum (Figure B). Clypeus dark-brown in colour. Labrum yellowish-brown with sparse yellow hairs on ventral margin. Mandible reddish-brown, but black distally. Maxillae and labial palpi reddish-brown in colour.

Thorax: Pronotum narrow, yellowish-brown centrally and brown laterally with small hairs. Mesonotum yellowish-brown dorsally and dark-brown laterally. Yellowish-brown hairs on whole mesonotum sparse. Metanotum dark-brown with lateral hairs.

Wings: Membrane hyaline forewings with brown veins. External margin somewhat concave with parabolic apex. Costal area of the forewing with 15 veins before pterostigma. Pterostigma elongated, filling 5 rows of cells, hairs seen in external margin as well as in inner veins. Hindwing filiform, dark brown in its three basilar quarters, white at end, with a visible central vein, divided at base. It is 2.5X times longer than forewing.

Legs: Coxa, trochanter, yellowish-brown in colour. Femur also yellowish-brown in colour with small dark-brown hairs. Tibia dark-brown without tibial spurs. Tarsus dark-brown with 1-5 segments. Claws small, reddish-brown distally.

Abdomen: Smaller than forewing with alternate blackish-grey and harbour-grey. Abdominal tip of female specimen (Figure D) broad and without distinct sternite 8.

Remarks: Male can easily distinguished from females by elongate, slender abdominal tip and gonarcus with arcessus.

Distribution: India (widespread)

Material examined: India: 2♀, Pudunagaram, Kerala, 10.683 N, 76.683 E, 02.ii.2020, 10.ii.2020, 1.00 a.m., 1.30 a.m., leg. Bijoy C, SERLNR048, SERLNR049; 2♀,

Figure 1 (A-D). *Croce filipennis*: **A.** Habitus in dorsal view, **B.** Head frontal view with rostrum, **C.** Forewing showing five rows of cells in pterostigma, **D.** Abdominal tip of female.

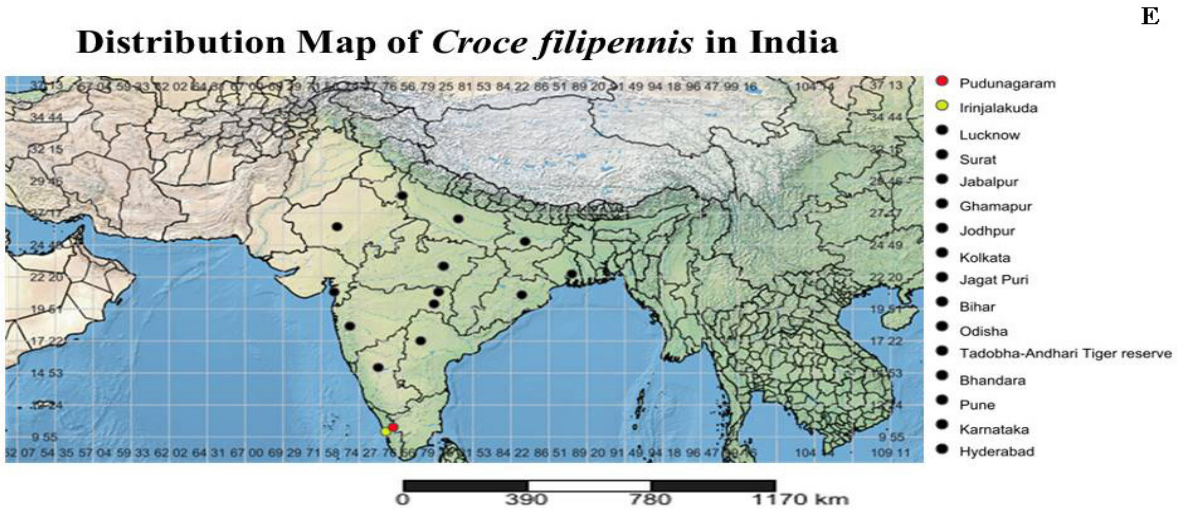

Figure 2. Distribution map of *Croce filipennis*.

Irinjalakuda, Kerala, 10.333 N, 76.233 E, 15.ii.2020, 05.iii.2020, 6.30 p.m., 6.20 p.m., leg. Suryanarayanan T. B, SERLNR050, SERLNR052; 1♀, Irinjalakuda, Kerala, 10.333 N, 76.233E, 03.iii.2020, 5.30 p.m., leg. Aswathy M. Das, SERLNR051; 1♀, Irinjalakuda, Kerala, 10.333 N, 76.233E, 10-III-2020, 4.30 p.m., leg. Aswathi P. G, SERLNR053; 1♀, Irinjalakuda, Kerala, 10.333 N, 76.233E, 03.ii.2021, 1.00 a.m., leg. Bijoy C, SERLNR105.

Distribution: India: Uttar Pradesh (Lucknow), Gujarat (Surat), Madhya Pradesh (Jabalpur, Ghamapur), Rajasthan (Jodhpur), West Bengal (Kolkata), Delhi (JagatPuri), Bihar, Odisha, Maharashtra (Tadobha-Andhari Tiger reserve, Bhandara, Pune), Karnataka, Telangana (Hyderabad) (Ghosh, 1977, 1983, 1998; Ghosh & Sen 1977; Sharma *et al*., 2001; Sharma & Chandra 2012, 2013; Chandra *et al.*, 2011; Rajasekar & Sridevi, 2018) (Figure 2).

Discussion

Nemopteridae is an exciting family of Neuroptera due to their attractiveness and mosquito-like appearance. Like most insects of Neuroptera, this group is also less studied in India and is not reported previously from Kerala. The literature survey showed a definite paucity of information of *Croce filipennis* from this region. From the available literature, this species is only reported from India which has got a widespread distribution in the country. The present paper aimed at giving the characteristic morphological features of *Croce filipennis* along with its distribution in India. It will serve as a reference for future exploration studies on Nemopterids not only in Kerala but also in other parts of the world.

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